Space Weather Technical Forecast

Issued on Monday, 03 January 2022 at 00:50 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Slight chance of G1/Minor storm on 03 January. Slight chance of moderate solar activity until 04 January.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity was low, was two C-class flares from AR2918 at the start of the period, although this region has now rotated across the northwest limb. There are two sunspot regions remaining on the visible disc, AR2916 (Dac/Beta) close to the southwest limb, and AR2922 (Cro/Beta) in the southern central disc. AR2916 is a mature, complex, but relatively inactive region, with AR2922 both small and weak. No Earth-directed CMEs have been observed on available imagery.

Solar Wind / Geomagnetic Activity: Solar winds, observed by DSCOVR and ACE at L1, have steadily declined through the last 24 hours from a peak of 600km/s, and are now averaging around 525km/s. Density was around or slightly above average, generally around 13ppcc. Total magnetic field strength has been mainly moderate, but was weak between 02/0930UTC and 02/2300UTC. The north-south component varied weakly throughout. Phi angle has been mainly positive (away from the Sun), with brief weak switches into the negative orientation. Geomagnetic activity has been Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) remained at background levels. High energy electron flux (greater than 2MeV) has been background or moderate levels. Electron fluence was well below the Active threshold at 5.45e6 integrated pfu at 02/2400 UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Low or very low solar activity is forecast, with the main risk of flare activity from AR2916.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are forecast. The high speed stream from coronal hole 40 is expected to decline to background levels through 03 January and 04 January. Geomagnetic activity is expected to be mainly Quiet to Unsettled on 03 January with a slight chance of Active intervals. Mainly Quiet intervals are then expected from 04 January.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to remain at background levels, with a very slight chance of S1 due to the potential contained within one significant sunspot region. High energy electron flux (greater than 2MeV) is increasingly likely to exceed the high (1e3pfu) level during the period due to effects of the current high speed stream. Electron fluence is not expected to exceed the Active (1e8 integrated pfu) threshold.

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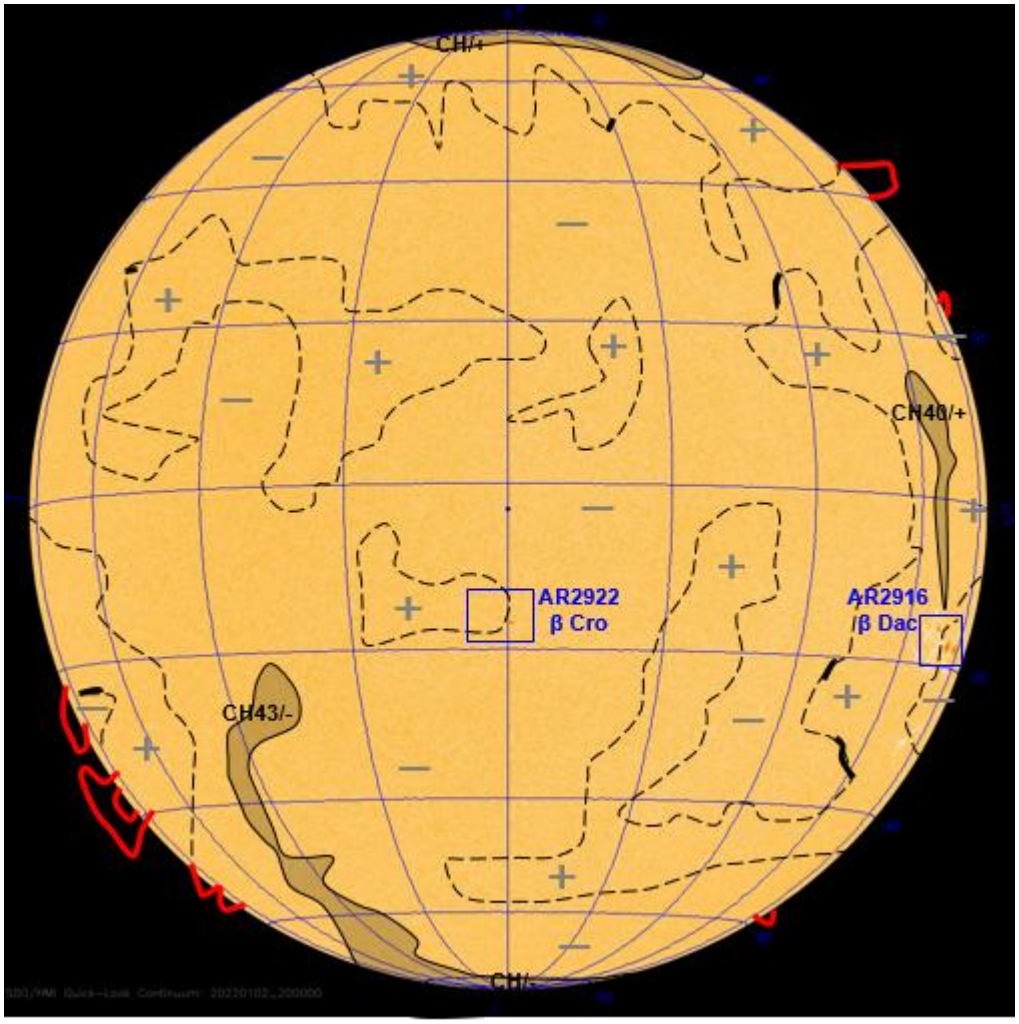
Figure 1. Solar Analysis Valid 02/2000UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

No Earth-directed CMEs are forecast through the next four days.

Solar wind speeds are currently slightly elevated under the influence of the high speed stream from coronal hole 40. Speeds are beginning to decline as the coronal hole moves towards the western limb, with this decline expected to continue through 03 and 04 January. No further coronal holes are expected to connect with the Earth over the next four days.

Geomagnetic activity is expected to be mainly Quiet to Unsettled with a slight chance of Active intervals on 03 January. Mainly Quiet intervals are then expected from 04 January.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

None expected.

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Figure 2: L1 (DSCOVR and ACE) solar wind observations for the last 24 hours.

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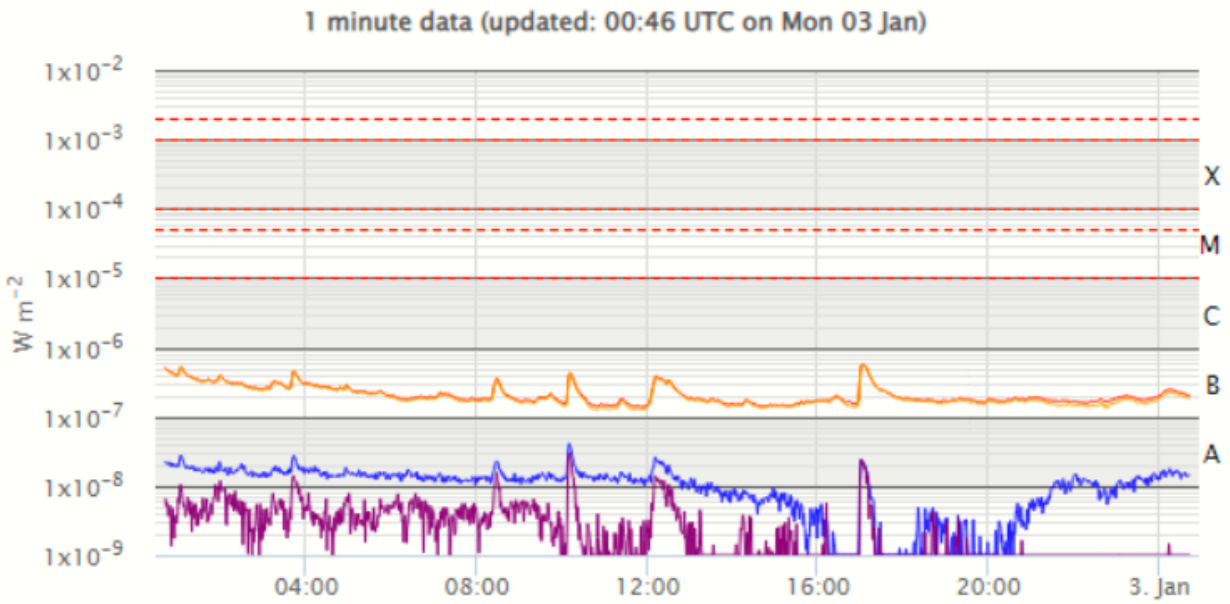
Radio Blackouts - X-Ray Flares:
Solar activity is expected to be mainly low or very low over the next four days. AR2918 has rotated across the northwest horizon in the last 24 hours, but still presents a flare risk, as any raised flaring will be visible from beyond the horizon on 03 January. AR2916 (Dac/Beta) will rotate across the western horizon on 04 January, with only one weak sunspot then remaining in the centre disc. No new regions are forecast to rotate onto the visible disc in the next four days.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	10	5	1	1
Very Active	R3 to R5 X Class	No	3	1	1	1

Figure 3: GOES 16 X-ray flux observations for the last 24 hours.



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as observed by GOES-16 is currently at background levels and will most likely persist as such. Despite the apparent stability, 2916 continues to be monitored for potential radiation storms.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2MeV) is at background to moderate levels, but are expected to start increasing through the forecast period. High (1e3pfu) levels are increasingly likely as the period progresses.

Electron fluence is forecast to follow an increasing trend but is not expected to reach the Active (1e8 integrated pfu) threshold.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	10	20	20
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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